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**Economic Benefits of Studying Economics in
Canada: A Comparison of Wages of Economics
Majors with those in Other Disciplines Circa 2005**

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Abstract: In universities across many western countries, student enrolments in economics discipline rose sharply towards the end of last decade but not in Canada. One reason for this outcome may be the continued perception of Canadian students of a lower economic reward to an economics degree. Using micro data from the 2006 census, we perform a comparative analysis of the wages earned by university degree holders in 50 disciplines in relation to economics. At undergraduate level, economics majors earned the 9th highest average wage in 2005, after controlling for demographic variables. On average, after controlling for demographic differences, workers whose wages were below those of economics majors earned about 16 percent lower while those who earned above economics majors earned about 10 percent higher. Similarity of their wages with physical science majors and their wage advantage over political science majors are also striking findings of this study. At graduate level, economics majors have greater wage advantage over other disciplines except for the business majors.

Keywords: Education, Economics degree, Economic returns to human capital, Wage differentials.

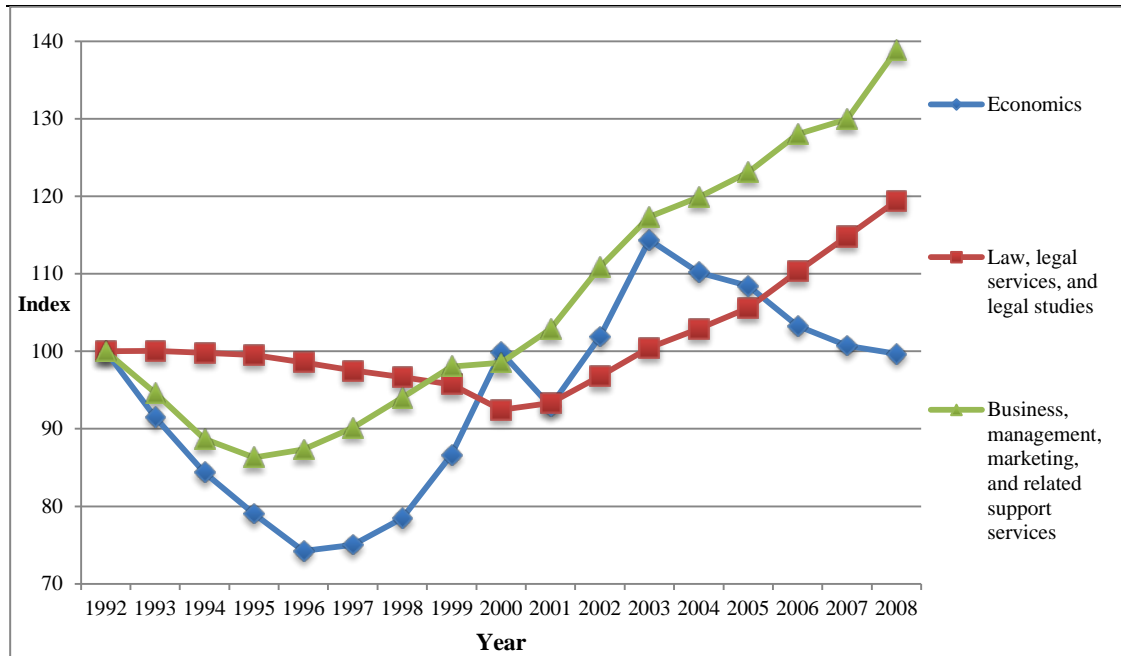
JEL Classification: J6, J15, J61

In recent years, interest in economics education has risen among university students in many western countries. Milmow and Tuck's (2011) review shows this to be true for Australia, Britain, New Zealand and the United States.ⁱ Seigfried (2010 & 2012) further confirmed this trend in the United States using data until 2011. There is some attribution of this rising trend to the Global Financial Crisis (GFC) of the period 2007-2012, although it is also recognized that it may be too early for the GFC to have its effect on the enrolment data. Prior to the GFC, enrolments of economics majors had been falling in those countries. In Canada, however, their enrolments were falling towards the end of the last decade while enrolments in two close competing disciplines, business and law, were consistently rising (Figure 1).ⁱⁱ One reason for this outcome may be the continued student *perception* of lower market rewards to an economics degree in Canada compared with others.ⁱⁱⁱ It is therefore important for students, faculty and university administrations to know what current data suggest about the *actual* market evaluation of an economics degree. For university administrators, this information is useful as declining public funding has made it important for them to respond to market demand (Snowdon, 2005). This information is also important for students and their parents who make financial sacrifices to pursue

university education with the expectation of reaping financial benefits in future. It is also important for university faculty members as they determine the demand for their research and the courses they offer. Offering courses to students which will improve their market reward from university education is a desirable response from an economic point of view.^{iv}

In this paper, we use the 2006 Canadian population census micro data to analyze an important indicator of the labour market reward for education, i.e., earnings of university degree holders. Our special focus is on those who hold a degree in economics awarded by a Canadian university. The analysis conducted in this paper is mostly based on Black, Sanders and Taylor (2003) who used the US data for their study. We first analyze general results and then draw a comparison of them for different fields of study with economics majors. These comparisons also control for differences in demographic characteristics of workers.

Figure 1: Trends in university enrolments in three degrees: business, economics, and law.



Source: Statistics Canada Post-Secondary Student Information System (PSIS), annual survey, customized tabulations.^v In terms of Classification of Instructional Program (CIP) levels, Economics is at 4 digit classification while the other two are at 2-digit (broader) level.

Some characteristics of the data used in this study

To use the 2006 census data for our purpose of study, we accessed the 20 percent sample of micro data through the Atlantic Research Data Centre of Statistic Canada at Dalhousie University. For this access, special permission was granted by Statistics Canada through Social Sciences and Humanities Research Council. These data enable the classification of a person’s major field of study in which he / she was granted the

highest postsecondary certificate, diploma or degree. Statistics Canada classifies the major fields of study by using the Classification of Instructional Programs (CIP)^{vi}, which includes 1375 instructional program classes with finer breakdowns provided up to 6-digit codes. In order to avoid small sample sizes, we had to do some aggregations. We used the first 2-digits of the CIP codes to divide most of the 1375 programs into various groups. For some business and social sciences majors, including economics, we used the first 4-digit levels of CIP. After these aggregations, we were left with 50 degree programs, i.e., we were able to compare economics majors with majors in 49 other disciplines.

The overall sample is limited to only fulltime wage earners who do not have any activity limitations and are aged between 25 and 55 with a postsecondary degree earned in Canada. After these restrictions, the sample had 362,923 observations. It should be noted that the labour market information collected for the 2006 census pertains to the year 2005.

To provide a general overview of the overall labour market performance of workers who have obtained university degrees in different disciplines, we have reported in Table 1 their unemployment rates and the average hourly wage rate earned by full time paid workers in each discipline. These data are for the year 2005 and are reported by gender for those aged between 25 and 55. As these data are weighted, they reflect values for the entire population.

As Table 1 shows, wage and unemployment rates vary dramatically by fields of study – from \$21.30 in case of legal services to \$46.34 in finance and 1.94% unemployment rate in health services to 8.33% for precision production. The highest three average wages are earned by finance, law, and engineering majors. Workers who have economics major earn the 6th highest average hourly wage among the 50 majors whose data are reported. On average, the wages of workers who earn below economics majors are 24 percent lower while wages of those who earn above economics majors are 7.8 percent higher. Economic degree holders also earn substantially higher (about 21 percent higher) than political science majors although the two degrees may be viewed as close complements.^{vii} Except for a few majors, gender differences in unemployment rates and wages are significant: male workers have lower unemployment rates with higher average hourly wages than female workers do. Another striking finding in Table 1 is the similarity of the unemployment rates of economics majors with those of majors in engineering, biological sciences, physical sciences and mathematics.^{viii} The most popular major is education followed by engineering and business administration degrees. Interestingly, despite the fact that finance has the highest average hourly wage, it is among the least populated business majors.

Table 1: Unemployment rates and average hourly wages for workers with bachelor's degree in 2005

Major	All			Female			Male		
	Wage	#	Un%	Wage	#	Un%	Wage	#	Un%
Agriculture	28.35	10,259	2.12	25.84	4,004	3.42	29.96	6,255	1.24
Natural Resources	29.96	11,402	4.13	25.52	3,955	5.94	32.32	7,447	2.86
Architecture	31.93	8,666	3.10	29.84	2,896	2.86	32.98	5,770	3.25
Area, Ethnic, Cultural and Gender Studies	26.38	3,821	7.04	26.51	2,912	6.64	25.95	909	8.24
Communication Studies	28.00	20,669	4.40	27.58	12,610	4.63	28.66	8,059	3.82
Communication Technology	27.12	1,307	5.88	30.24	640	6.98	24.13	668	4.76
Computer & Information Sciences	34.84	44,046	3.75	35.37	9,536	4.20	34.70	34,510	3.66
Education	29.19	160,023	2.19	28.85	115,432	2.33	30.08	44,591	1.78
Engineering	41.31	108,442	3.07	36.83	13,329	4.70	41.94	95,113	2.81
Foreign Language and Literature	27.35	10,418	4.62	26.65	8,438	4.39	30.36	1,980	5.46
Work & Family Studies	26.07	7,647	4.11	26.47	6,934	4.16	22.18	713	3.64
English Language and Literature	28.27	23,043	4.21	27.58	15,261	4.24	29.64	7,782	3.98
Liberal Arts and Sciences	33.32	28,004	4.11	31.45	16,383	4.32	35.94	11,621	3.78
Library Services	30.24	271	4.35	31.87	230	4.21	21.04	41	4.92
Biology/Biological Sciences	29.54	34,720	3.92	27.68	18,079	4.64	31.55	16,641	3.08
Mathematics	39.49	13,140	3.49	35.25	4,862	3.69	41.99	8,278	3.37
Military Technologies	31.78	310	2.38	33.83	18	n/a	31.65	292	n/a
Biological and Physical Sciences	33.54	25,215	3.91	29.87	12,145	4.60	36.94	13,070	3.20
Parks, Recreation and Leisure Studies	28.34	24,628	2.91	26.70	11,557	3.32	29.79	13,072	2.48
Biblical Studies	20.25	4,813	2.74	18.37	1,313	3.60	20.95	3,499	2.54
Physical Sciences	40.61	17,554	3.26	33.35	4,713	4.40	43.28	12,841	2.83
Biology Technician/Laboratory Technician	25.54	140	n/a	24.09	103	n/a	29.52	37	n/a
Psychology	27.90	45,677	3.73	26.89	32,452	3.80	30.40	13,225	3.55
Corrections	27.81	1,248	4.94	25.62	525	5.41	29.41	723	4.44
Human Services	27.34	20,061	3.28	26.92	16,056	3.41	29.00	4,005	2.81
Precision Production	22.50	144	8.33	n/a	n/a	n/a	21.20	132	9.09

Aeronautics/Aviation/Aerospace	31.04	629	2.00	28.42	107	n/a	31.58	522	2.38
Visual and Performing Arts	24.47	27,105	4.58	24.31	15,555	4.65	24.68	11,551	4.46
Health Services	35.52	68,108	1.94	35.22	57,931	2.20	37.27	10,177	1.23
History	28.95	18,750	3.92	26.55	7,456	4.80	30.54	11,294	3.27
French Language and Literature	28.58	6,501	3.87	27.94	4,948	3.87	30.63	1,553	3.91
Law (LLB, JD, BCL)	46.04	30,400	2.67	41.95	15,835	3.52	50.48	14,566	1.90
Legal Services	21.39	282	3.85	18.53	216	5.00	30.78	66	n/a
Legal Studies, General	28.39	557	5.88	26.34	387	4.55	33.07	169	8.33
Philosophy	28.38	3,672	5.43	24.66	975	7.96	29.72	2,697	4.24
Religion/Religious Studies	36.11	1,428	4.82	20.66	621	6.25	48.01	807	3.49
Social Sciences General	29.97	4,334	3.87	28.37	2,520	4.07	32.20	1,814	3.57
Anthropology	25.75	5,323	5.76	24.92	3,405	4.78	27.22	1,918	5.59
Archeology	24.68	893	6.10	20.43	603	4.00	33.51	290	9.38
Criminology	29.90	7,745	3.46	28.14	4,222	3.79	32.01	3,523	2.99
Economics	39.91	29,981	3.31	33.77	8,867	4.31	42.48	21,114	2.86
Geography	31.17	17,011	3.57	29.19	5,508	4.53	32.12	11,504	3.00
International Relations and Affairs	33.92	981	5.36	21.29	510	5.00	47.58	471	5.77
Political Science	32.94	21,914	4.50	29.72	8,213	5.24	34.86	13,700	4.02
Sociology	28.76	23,154	4.49	28.67	16,051	4.51	28.96	7,102	4.45
Business Administration and Management	37.97	118,463	3.16	31.95	48,309	3.93	42.12	70,154	2.64
Accounting	40.84	43,552	2.11	35.95	20,762	2.55	45.29	22,791	1.68
Finance	46.34	13,301	2.69	34.12	4,316	3.12	52.21	8,985	2.43
Marketing	30.85	11,589	3.77	27.79	5,357	4.19	33.48	6,232	3.38
Business Other	33.95	25,473	3.73	30.14	13,732	4.12	38.40	11,741	3.38

Source: Authors' calculations from the 2006 Census, micro data (20% sample).

Notes: (1) # shows the number of wage earners with at least a Bachelor's degree in each major, (2) all numbers are weighted thus reflect population results, (3) some cells have n/a due to the restrictions imposed by Statistics Canada.

Majors in economics degree earn below those with majors in law and some (such as Accounting and Finance), but not all, business disciplines. In contrast, the Australian study (Lewis, Daly and Fleming, 2004) had found that in Australia, those holding a degree with economics major earn more than those holding degrees with majors in law and business.

3. Comparing earnings across disciplines with demographic controls

The above results were general results. In order to draw a meaningful comparison between workers who earned their degrees in different disciplines, we must control for differences in their demographic compositions. In this Section, we do so to compare the hourly wage rates of workers who hold an economics degree with workers whose concentration is in other disciplines. Following Black, Sanders and Taylor (2003), we organized our data into different cells built on a set of demographic attributes (to be explained below) and estimated the following regression model:

$$(1) \quad \ln(w_i) - \ln(\bar{w}_j) = \beta \mathbf{Z} + \varepsilon_i,$$

where w_i is the wage of the person i , \bar{w}_j is the average wage of the cell j built on a set of demographic attributes that the person i possesses, \mathbf{Z} is the vector of

dummy variables for 50 majors (economics is the excluded major), β is the vector of coefficients of interest, and ε_i is the error term. The expression above demeans the wage (in natural logs) at each observation by taking the difference between a person's wage and the average wage of the cell that he / she belongs to. Hence β shows percentage differences between the economics and other majors in hourly wages for workers with identical demographic characteristics.

As a common practice, we use the number of hours worked in the reference week, i.e., the week prior to census enumeration, as proxy for average hours worked per week during the year. Hence, the hourly wage is calculated in this study as the total annual wage earned during the year divided by the product of the number of weeks worked during the year and the number of hours worked in the reference week. To address a possible bias introduced due to this measure, a subsample comprising only of workers who worked 52 weeks during the year and more than 35 hours in the reference week was also analyzed, in addition to weekly and annual average wages. The results did not differ substantially between hourly wages and other measures. Therefore, only regression results with hourly wages are shown below.^{ix}

We first report results for all bachelor degree holders. In order to assess sensitivity of results to demographic attributes, we organized data in three different cells in

Table 2. The first one (Cell1) is developed by age, gender and 15 different visible minority classifications.^x The second one (Cell2) uses age, gender, and immigration status (Canadian by birth or not) and classifies the above 15 visible minority groups in two large categories: non-visible and visible minorities. Finally the third cell (Cell3) is generated similar to Cell2 but with five new broader visible minority groups than identified in Cell 1.^{xi} Each cell definition gave us different numbers of cells. Thus for example, for the first cell definition we have 900 cells (30 age groups x 2 genders x 15 visible minority groups). To avoid smaller cell sizes, we restrict the estimations with cells that have 150 or more members.^{xii} Finally, it should be noted that a negative number in Table 2 means that an average worker who has declared the particular field of study as major earned below the one who has declared economics as the major field of study. A positive number means the opposite. We have also reported t-values to present statistical significance of each result.

A quick visual inspection in Table 2 shows that, except for a few majors, cell definitions do not cause a significant variation in the regression results. In general, workers with an undergraduate degree in economics fare very well when compared with others. In fact, there are only 8 majors out of 50 whose members earn statistically significantly higher than economics majors. Among workers who earn more, engineering (including chemical, civil, computer,

electrical/electronics, and mechanical engineering) has the largest wage differential, 16.84%; followed by finance, 13.86%; health services (dentistry, medicine, nursing, pharmacy, physical therapy, veterinary), 13.82%; and law, 13.20%. Interestingly, unlike Black, Sanders and Taylor's (2003) study that used 1993 data for the US, all business majors except for marketing earned higher average hourly wages than demographically comparable economics majors in Canada: accounting and business administration and management majors earn 9.22% and 2.98% more, respectively. Conversely, all majors in social sciences and humanities, such as history, political science, sociology, psychology, English literature, and philosophy earn much lower than economics majors. The close complement, Political science majors, now earn about 9 percent lower than economists.

Table 2: 2005 wage differences relative to economics major for workers aged 25 to 55 with bachelor's degree

Major	Cell1		Cell2		Cell3	
	%	<i>t</i>	%	<i>t</i>	%	<i>t</i>
Agriculture	-19.44	-9.77	-19.86	-10.20	-19.69	-9.98
Natural Resources	-7.83	-4.57	-8.30	-4.98	-8.09	-4.78
Architecture	-10.28	-5.28	-9.92	-5.23	-10.30	-5.33
Area, Ethnic, Cultural and Gender Studies	-17.55	-6.29	-19.65	-7.48	-17.60	-6.51
Communication Studies	-11.35	-7.35	-11.73	-7.89	-11.76	-7.70
Communication Technology	-22.31	-4.32	-20.99	-4.27	-22.82	-4.49
Computer & Information Sciences	6.82	5.19	7.44	5.93	6.80	5.26
Education	-7.94	-6.90	-8.20	-7.44	-8.21	-7.27
Engineering	16.84	14.01	16.31	14.12	16.59	14.07
Foreign Language and Literature	-15.14	-8.03	-16.34	-8.64	-16.06	-8.24
Work & Family Studies	-17.88	-7.95	-18.82	-8.79	-18.20	-8.20
English Language and Literature	-18.91	-11.94	-18.81	-12.35	-19.16	-12.23
Liberal Arts and Sciences	-16.42	-10.27	-16.40	-10.7	-16.43	-10.45
Library Services	-17.45	-2.10	-16.81	-2.15	-15.67	-1.84
Biology/Biological Sciences	-14.33	-9.48	-13.95	-9.65	-14.49	-9.71
Mathematics	5.83	2.86	6.23	3.24	5.85	2.93
Military Technologies	-2.60	-0.39	-2.74	-0.41	-2.84	-0.42
Biological and Physical Sciences	-3.15	-2.09	-3.02	-2.07	-3.41	-2.30
Parks, Recreation and Leisure Studies	-15.63	-10.48	-15.57	-10.75	-15.86	-10.69
Biblical Studies	-53.29	-24.15	-53.75	-24.95	-53.74	-24.65
Physical Sciences	-1.21	-0.65	-1.08	-0.61	-1.58	-0.86

Biology Technician/Laboratory Technician	-15.06	-1.23	-11.30	-1.07	-9.41	-0.87
Psychology	-15.00	-11.25	-14.90	-11.66	-15.11	-11.52
Corrections	-9.17	-2.27	-8.87	-2.34	-9.49	-2.35
Human Services	-11.15	-7.75	-11.61	-8.42	-11.67	-8.21
Precision Production	-43.95	-3.15	-42.53	-3.05	-42.23	-3.01
Aeronautics/Aviation/Aerospace	-16.62	-1.63	-17.24	-1.78	-17.45	-1.73
Visual and Performing Arts	-34.16	-20.52	-34.64	-21.43	-34.47	-20.83
Health Services	13.82	11.05	13.49	11.24	13.43	10.91
History	-16.97	-11.03	-17.21	-11.55	-17.34	-11.42
French Language and Literature	-14.29	-6.06	-14.53	-6.39	-14.75	-6.32
Law (LLB, JD, BCL)	13.20	7.44	12.84	7.52	13.18	7.52
Legal Services	-38.03	-3.69	-38.44	-4.05	-37.27	-3.89
Legal Studies, General	-0.58	-0.11	-3.43	-0.65	-0.71	-0.13
Philosophy	-23.44	-7.94	-23.13	-8.16	-22.90	-7.82
Religion/Religious Studies	-37.58	-7.15	-37.34	-7.57	-37.61	-7.17
Social Sciences General	-13.28	-5.36	-15.31	-6.38	-12.67	-5.54
Anthropology	-25.41	-8.97	-25.82	-9.37	-25.96	-9.16
Archeology	-23.10	-4.29	-23.37	-4.5	-23.16	-4.26
Criminology	-1.73	-0.94	-2.26	-1.27	-2.02	-1.10
Geography	-13.69	-8.44	-13.40	-8.47	-13.89	-8.65
International Relations and Affairs	-12.53	-2.00	-12.32	-2.17	-10.90	-1.89
Political Science	-8.60	-5.35	-8.16	-5.33	-8.60	-5.43
Sociology	-15.92	-10.41	-16.05	-10.96	-16.07	-10.59
Business Administration and Management	2.98	2.46	2.69	2.31	2.84	2.39
Accounting	9.22	6.77	9.01	6.90	8.79	6.56

Finance	13.87	7.13	13.04	7.05	12.99	6.82
Marketing	-4.85	-2.59	-4.49	-2.51	-4.90	-2.64
Business Other	-0.02	-0.01	-0.92	-0.59	-0.47	-0.3

Notes: (1) The dependent variable is the natural log of annual wage earned in previous year divided by the product of the number of weeks worked last year and the number of hours worked last week demeaned at each cell point. (2) Standard errors are robust and adjusted by cells. (3) The numbers of observations are 204,222, 218,532, and 206,356 for Cell1, Cell2, and Cell3, respectively. (4) Economics is the excluded major. (5) All estimations are weighted to incorporate the sample stratification provided by the data. (6) For cell definitions, please see the text.

In summary, our calculations based on Table 2 (Cell 1) results indicate that for those 41 disciplines whose majors earn below economics majors, the average percentage differential in hourly wages is about 16 percent while for those 8 disciplines whose majors earn above economics majors, the average differential is about 10 percent.

The above comparisons were performed for undergraduate (bachelor's) degree holders. It is also important to analyze wage differences at graduate levels for at least two reasons. First, the importance of a graduate level education is increasingly recognized in education policy circles in Canada (Finnie and Usher, 2007). An analysis of the comparative benefits of acquiring a graduate degree will be useful for students desiring to pursue higher education. Second, it could be argued that for some disciplines such as social sciences and humanities, the labour market is such that a bachelor's degree may not be the final entry-level postsecondary degree for job markets as much as it is for other majors such as business, economics, and engineering. This may also be true for some programs in physical science (astronomy, chemistry, physics, geology). For example, Black, Sander and Taylor (2003) found that about two-third of physics majors earned an advance degree in the US in 1993. If a significant portion of workers in a major pursue an advance postsecondary degree, the wage gap between that major and economics for workers who have only a bachelor's degree could be

misleading.

Table 3 below shows the number of workers who have a graduate degree (Masters or PhD) relative to the number of workers who have only a bachelor’s degree as their highest postsecondary education. We report data on only a few more popular majors to avoid presenting a longer Table. ^{xiii}

Even though the numbers do not reflect demographic differences or information whether workers obtained their previous degree in the same discipline, the significant variation in the percentage of graduate degree holders within each major is striking.^{xiv} Students obtaining their undergraduate degrees in International Relations and Affairs are the most likely to pursue a graduate degree rather than join the labour force. On the other hand, those with undergraduate degrees in Accounting, Finance and Computer & Information Sciences are the most likely to do so. About one-sixth of economics undergraduates are likely to pursue a graduate degree. These findings are reflective of the market demand for graduates in each discipline.

Table 3: Number of workers with graduate degree relative to the number of workers only with bachelor's degree for selected majors.

Major	%	Major	%
Education	23	Engineering	28
English Language and Literature	20	Computer & Information Sciences	17
Psychology	32	Biology/Biological Sciences	51
History	23	Mathematics	24

Philosophy	44	Physical Sciences	61
		Business Admin.	
Anthropology	25	&Management	42
Archeology	45	Accounting	12
Geography	17	Finance	15
Political Science	19	Economics	21
Sociology	14		
International Relations and Affairs	100		

Source: Authors' calculations from the 2006 Census micro data (20% sample).

Table 4 below compares wage gaps between economics and other majors for workers who only have an undergraduate (bachelor's) degree (data in the first two columns are copied from Table 2 for the convenience of reader) and those who have a graduate degree. We also provide t-values for statistical significance of the difference with economics. In 24 out of the 28 disciplines considered, the wage gap is negative with economics indicating graduate economics degree holders earn more than do those in other disciplines. The negative wage gaps at graduate level are wider than at undergraduate level indicating a clear advantage of studying economics at graduate level. Engineering majors who had the most advantage over economic at undergraduate level, lose this advantage at graduate level (falling from 16.89 to -8.89 percent). Students pursuing graduate degrees in all business related disciplines increase their advantage over those who study economics at graduate level, with Finance degree holders gaining the most.

Table 4: Hourly wages relative to economics major for workers aged 25 to 55 with undergraduate and graduate degrees for selected majors

Major	Undergraduate		Graduate	
	%	<i>t</i>	%	<i>t</i>
Agriculture	-19.44	-9.77	-30.98	-7.98
Architecture	-10.28	-5.28	-30.98	-9.52
Computer & Information Sciences	6.82	5.19	-18.92	-5.58
Education	-7.94	-6.90	-20.58	-7.97
Engineering	16.84	14.01	-8.89	-3.24
English Language and Literature	-18.91	-11.94	-39.68	-11.26
Liberal Arts and Sciences	-16.42	-10.27	-39.80	-7.72
Biology/Biological Sciences	-14.33	-9.48	-38.01	-11.92
Mathematics	5.83	2.86	-21.16	-4.24
Psychology	-15.00	-11.25	-31.72	-11.31
Aeronautics/Aviation/Aerospace	-16.62	-1.63	-47.93	-2.05
Visual and Performing Arts	-34.16	-20.52	-60.80	-15.98
Health Services	13.82	11.05	-21.68	-7.38
History	-16.97	-11.03	-37.31	-10.26
Law (LLB, JD, BCL)	13.20	7.44	-4.35	-1.06
Philosophy	-23.44	-7.94	-45.54	-9.48
Anthropology	-25.41	-8.97	-59.21	-5.41
Archeology	-23.10	-4.29	-43.20	-6.86
Criminology	-1.73	-0.94	-22.36	-5.29
Geography	-13.69	-8.44	-25.29	-6.88
International Relations and Affairs	-12.53	-2.00	-22.05	-3.80
Political Science	-8.60	-5.35	-24.65	-6.75
Sociology	-15.92	-10.41	-36.05	-8.34
Business Administration and Management	2.98	2.46	13.26	4.97
Accounting	9.22	6.77	7.30	1.73
Finance	13.87	7.13	29.25	7.35
Marketing	-4.85	-2.59	2.93	0.58
Business Other	-0.02	-0.01	-7.81	-2.18

Notes: (1) The dependent variable is the natural log of annual wage earned in previous year divided by the product of the number of weeks worked last year and the number of hours worked last week demeaned at each cell point for CELL1. (2) Standard errors are robust and adjusted by cells. (3) The numbers of observations are 204,222 and 60,185 for Undergraduate and Graduate, respectively, with cells that have 150 or more workers. (4) Economics is the excluded major. (5) All estimations are weighted to incorporate the sample stratification provided by the data.

Further insights into the above results can be obtained by analyzing our data for different age cohorts. Such analysis helps us understand the progress individuals could expect to make as they experience on job in each discipline. Table 5 reports undergraduate degree holders' wage gaps with economics in selected disciplines classified by six age groups. As before, a positive gap means higher wages in the discipline than in economics (for convenience, we will call them advantaged discipline) and a negative means lower wage (disadvantaged discipline).

In most cases, for those who major with advantaged disciplines, their wage gap with economics diminishes until they reach age 50, while it rises for those in disadvantaged disciplines. These results are remarkable as they indicate that economics graduates are faster learners on job than others. For graduates in the disadvantaged disciplines, a narrowing of wage gaps takes place after they reach 50 years of age while a widening occurs for those in this age group with advantaged disciplines. Their rising gaps in disciplines such as Computer and Information Sciences, Accounting, Health, etc. could reflect their "premia" for being senior members of professional organizations.

Table 5: Wages relative to economics major (%) for workers with bachelor's degree by age cohorts

Majors	- 30	30-35	35-40	40-45	45-50	50+
Agriculture	-6.24	-17.54	-22.60	-27.86	-25.77	-19.02
Architecture	-1.91	-9.62	-18.57	-13.57	-8.57	-3.94
Communication Studies	-3.18	-5.57	-14.01	-15.68	-23.50	-8.52
Computer & Information Sciences	14.51	10.40	5.59	4.78	3.94	5.93
Education	6.08	-4.34	-11.61	-14.53	-17.40	-6.21
Engineering	23.92	19.84	12.67	11.98	10.76	22.77
Foreign Language and Literature	-6.21	-9.71	-20.37	-27.40	-24.16	-10.54
English Language and Literature	-15.31	-17.41	-20.64	-25.67	-21.21	-7.13
Liberal Arts and Sciences	-11.04	-18.23	-16.47	-20.00	-21.02	-10.12
Biology/Biological Sciences	-16.41	-5.72	-9.76	-14.49	-24.12	-6.00
Mathematics	13.81	10.61	1.93	1.64	-0.90	12.43
Psychology	-6.73	-6.13	-17.67	-23.41	-24.72	-11.32
Human Services	6.75	-5.28	-18.75	-19.74	-23.30	-8.41
Visual and Performing Arts	-31.58	-32.57	-34.59	-34.79	-41.41	-26.45
Health Services	33.83	20.29	9.05	2.27	1.19	12.36
History	-11.71	-12.99	-16.23	-26.31	-24.87	-9.33
French Language and Literature	-5.16	-12.57	-25.39	-18.22	-30.03	5.68
Law (LLB, JD, BCL)	9.72	15.08	15.66	11.87	7.44	22.88
Philosophy	-23.55	-17.25	-20.81	-34.94	-37.69	-3.42
Anthropology	-14.02	-31.45	-23.18	-26.17	-37.96	-11.71
Archeology	-4.97	-12.68	-26.97	-52.17	-37.97	-9.24
Criminology	2.77	1.66	-2.82	-3.48	-3.11	-7.87
Geography	-6.27	-6.35	-19.23	-17.84	-19.09	-9.43
Political Science	-2.87	-0.85	-5.32	-19.20	-15.40	-4.74
Sociology	-8.48	-8.96	-14.69	-21.40	-26.18	-18.15
Business Administration and Management	9.85	6.41	0.93	-1.25	-2.70	3.45
Accounting	14.67	12.72	10.62	3.89	0.82	11.42
Finance	12.45	18.42	14.28	16.83	11.16	6.87
Marketing	-1.15	1.89	-2.93	-6.52	-19.33	22.01
Business Other	4.33	2.75	2.52	-2.55	-13.12	3.51

Notes: (1) The dependent variable is the natural log of annual wage earned in previous year divided by the product of the number of weeks worked last year and the number of hours worked last week demeaned at each cell point for CELL1. (2) Standard errors are robust and adjusted by cells. (3) Starting from the first column, the numbers of observations are 44,770, 41,752, 37387, 35,143, 30,207, 24,134, respectively. (4) Economics is the excluded major. (5) All estimations are weighted to incorporate the sample stratification provided by the data.

Concluding remarks

While estimating the economic benefits of an economics degree has been the subject of many studies in the west, such studies are lacking in Canada. We analyze 2006 census micro data as an attempt to fill in this gap. Undergraduate degree holders in only five of the fifty 50 major disciplines we considered, earn more than those who hold a degree in economics. Those who hold a graduate degree in economics face a narrower earning gap with those five disciplines, while a wider gap with the forty four disciplines over which they have an earning advantage. Finally, once they are on job, economics majors experience faster growth in earnings compared to those with degrees in other disciplines. The unemployment rates among economics majors are among the lowest and similar to those among engineering, biological sciences, physics and mathematics.

The clear private economic benefits to obtaining an economics degree, as demonstrated in this study in terms of wage and employment prospects, are consistent with those found for Australia by Dally and Lewis (2010) and for the United States by Black, Sanders and Taylor (2003) and Freeman (1999). The 2003 United States study has also shown that an undergraduate degree in economics not only provides better market rewards, it also increases the market value of a graduate degree obtained in other related disciplines. While our data do not permit such an analysis, the patterns of earnings gap observed at graduate

level perhaps indicate a better preparation for graduate work. Faster earnings growth of economics majors also indicates their better labour market preparation than other disciplines. These are some important results which economics departments across Canadian universities can use to reduce any student perception of lower economic benefits of obtaining an economics degree and have their enrolments turn around. We also expect these results to push those *marginal* students towards economics discipline who may have got recently interested in it due to GFC, but are hesitating to make a final decision due to their perception of lower market rewards to an economics degree.

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Endnotes

ⁱ In Australia, there has only been a modest increase, but these authors maintain that Australian data are not as reliable to draw this conclusion as they are for other countries.

ⁱⁱ Millmow and Tuck (2011) view business and law degrees to be competing with economics degree in Australia while Siegfried and Round (2001) view business degree to be competing with economics in Australia, Canada, Germany and the United States. Since Figure 1 data are only until 2008, they may not yet be affected by GFC. It should be noted that Siegfried (2011 & 2012) considered the award of degrees in economics disciplines in the US universities, while the Canadian data we present in Figure 1 are only on enrolments.

ⁱⁱⁱ Students' perception of lower economic reward to an economics degree could have resulted from their comparison of economics courses with (other) business courses. An Australian study by Millmow and Bookallil (2006) found that vocationally-driven students, particularly females, could not readily see how an economics degree could lead on to employment opportunities. To many students, the prevailing mindset was that doing economics did not mean a job at the end of the day. They opt for a more employment-enhancing business degree.

^{iv} Of course, social externalities generated by higher education remain important for consideration of public funding of higher education.

^v Phased implementation of PSIS started in the year 2000. For the 2008/2009 collection year, PSIS covered 80% of public institutions. To the best of our knowledge, these data are comparable over time because Statistics Canada maintains that "the target population of PSIS is very stable and the survey is mandatory, therefore minimizing under-coverage." Some anomalies in the data may be present due to addition of some institutions in 2008. For detailed information regarding collection and quality of these data, we refer the reader to the following web site:

<http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=5017&lang=en&db=imdb&adm=8&dis=2>

^{vi} Details of coding can be found on the following web site of Statistics Canada:

<http://www23.statcan.gc.ca:81/imdb/p3VD.pl?Function=getVDPPage1&db=imdb&dis=2&adm=8&TVD=127939>

^{vii} Political scientists deal with political systems which have strong influence on the way resources are distributed in the economy. London School of Economics and Political Science is one of the oldest and top-ranked schools in the two fields.

^{viii} At Ph.D level, Freeman (1999) reports that economics majors in the U.S. enjoy a better job market than Ph.Ds in two of the most important scientific areas, mathematics and physics.

^{ix} To address a possible bias introduced due to this measure, we also analyzed a subsample comprising only of workers who worked 52 weeks during the year and more than 35 hours in the reference week. The results did not differ substantially between hourly wages and other measures. Therefore, only regression results with hourly wages are discussed in the text.

^x 13 visible minority types (Chinese, South Asian, Black, Filipino, Latin American, Southeast Asian, Arab, West Asian, Korean, Japanese, visible minority n.i.e, multiple visible minority, Aboriginal), 1 non-visible minority, and 1 not applicable.

^{xi} (1) Non-visible; (2) Aboriginal; (3) Chinese, Southeast Asian, Korean, Japanese, Filipino; (4) West Asian, Arab, South Asian; (5) Latin American, multiple visible minority, Black.

^{xii} The test results show that the regression results are not sensitive to cell sizes.

^{xiii} A Table with all fifty disciplines can be provided upon request.

^{xiv} The census provides CIP code information only for the highest degree obtained by an individual and not separately for undergraduate and graduate degrees.